Miguel, Amblard, Barceló & Madella (eds.) Advances in Computational Social Science and Social Simulation
Barcelona: Autònoma University of Barcelona, 2014, DDD repository <http://ddd.uab.cat/record/125597>

User Profiling in Multiplayer Serious Games

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***Abstract*—Designing multiplayer serious games that support collaborative learning has become a promising area of education techniques. Player should play a game with a proper level of ability and skills. Current approaches to adapt game make it possible for different elements to adjust to the player. However most of these approaches can adapt one single player; so we need to find ways to aggregate all users input and history into some potential information that can be used for the adaptation mechanism, we believe that user's profiling respond to these need by providing a detail analysis of player's performance. The goal of our research is to provide a novel approach for game adaptation correlated to a user's profile that guided by two concerns: player skill levels and social interaction between players. To achieve this, we present a conceptual user's profile.**

Keywords: **user's profiling, collaborative learning, multiplayer serious game,**

I. Introduction

Nowadays, due to the New Technologies advance, learning forms have changed in classroom and become more effective and enjoyable, one of most widely used approaches is collaborative game. Game-Based Learning (GBL) is used as a learning strategy through game play. Various researches [1] have shown that Collaborative serious game enhances social competencies such as collaborative decision-making, negotiation and communication. The essence of serious game is to be adapted according to the level skill of each user. This user is defined and coded in the game: all serious game include a profile of the user. In one single player games, it presents a classification of the target players and a memory of player's actions in the game. In multiplayer games the model contains social parameters and behaviours, and it can also be a cognitive model.

With Serious game technology and Collaborative learning, users-centred design is required now more than ever to provide an adaptable and personal content (level); Due to the lack of concepts for multiplayer serious games, only a limited number of Serious Games have been designed with multiplayer support. Multiplayer Serious Game used with collaborative learning purposes should be adaptable to each player; so we need to find ways to aggregate all users input and history into some potential information that can be used for the adaptation mechanism. We believe that user's profiling respond to these need by providing a detail analysis of player's performance.

We aim to provide an approach for game adaptation correlated to a user's profile. It will supply response to each player's individual needs. The goal of our research is to define a profile of users able to define the strategy of adaptation to all players and support the collaborative learning principals in multiplayer serious game.

In this paper we give a brief survey of the current researches on user's profile for game adaptation next we introduce a possible structure of user's profile and. In the end, the conclusion and future work are given.

II. Related Works

The user profile represents user properties such as knowledge, behaviour, and goals. It contains evaluations of the physical situation, psychological and social parameters deduced from existing cognitive and sociological models [2]. In multiplayer game, players have individual engagement and social engagement: personal engagement refers to the perceived competence and skills level, social engagement refers to the types of interaction between players.

User profiling is the most studied area in current Technology Enhanced Learning systems, which is a necessary feature to meet the effectiveness requirement for each adaptive game. Several research areas on user profile have conducted, there are two distinct ways of implementing user profile: user-controlled and computer-controlled [3], the first one tries to adapt game according to a feedback given by the user, the second personalize game according to user's needs and preferences.

Picard [4] has based on emotional communication (frustration, confusion, disliking, interest…) to design user profile. According to Bartle [5], in role-playing, players that have same preference can be grouped into same category: achiever, explorer, socializer and killer. These types are generated from the analysis of a multi-user dungeon (MUDs). The user's profile proposed in [6] considered three

possible levels: "user modeling, which includes a profile of an individual user, user clustering, which is based on similarities between user profiles and forming a user cluster using some form of automated technique, and community modeling, which includes a profile about the social group as a whole, not as the sum or the average of its individual member's profiles". These levels can be used simultaneously to personalize social and individual preference in multiplayer serious game. Many applications in internet training system [2] have used an user profile based on three levels: generic model which includes general information about the player (age, gender…), in addition to general information, localized model represents knowledge of the user's location and personalized model is based on complex state variables about each user. [7] proposed a user's profile called group model, it based on communication and action between players. User's profile proposed by most these works still utilisable in specific domain and not generalized. All of these methods use the user's profile to optimize the playability factor of the game and few works have exploited the adaption in game according to the user's profile.

III. Multiplayer game in collaborative learning

The use of serious games with group activities in which the primary activity for the trainee is the action of playing, the knowledge and cognitive skills development are the result of this process. Our main research goal is based on the collaborative learning which offers group trainees to achieve common goals while they are learning. Collaborative learning fosters development of interpersonal competencies and social connectivism such as collaborative decision making, negotiation and creative solution. In multiplayer serious games each trainee depend on others, they help and provide advises to others.

Johnson and Johnson (1994) propose five essential components which enhance collaborative work [8]:

A. Positive interdependence

A group success or failure represents individual success or failure, each player cannot succeed alone.

B. Individual accountability

The results of each individual performance evaluation are given back to both the group and the individual.

C. Face to face promotive interaction

Promoting behavior, each trainee encourages others to success by helping, sharing their knowledge during learning process.

D. Social skills

Group skills, interpersonal competencies and communication are essential to enhance the collaborative work.

E. Group processing

The group evaluates itself to estimate their work.

IV. Structure of user's profile

Collaborative learning has also combined in educational videogame. As we showed in section 3, there are several requirements which need to be met in order to facilitate the incorporation of collaborative learning in serious games. In our context, we are based on these guidelines (see Johnson and Johnson 1994) to propose the conceptual user's profile.

The user's profile is based on two levels: knowledge and competence model, social model.

A. Knowledge and competence model

Which collects data about the player, it includes possible estimation of the skill levels and competence of the player, this information can be obtained through deliberate answer investigation or induced in real time from actions and behavior of the player.

TABLE I.
KNOWLEDGE AND COMPETENCE MODEL

Attribute	description
Identifier	Identification
Name	Trainee name
Age	Trainee current age
Sex	Trainee gender
Score (skill level)	Marks obtained
Proposed goals	List of proposed goals to be learning
Faced goals	List of goals that the trainee has started, tasks completed.
Achieved goals	List of goals that the trainee has achieved
Proposed tasks	List of proposed tasks to be performed
Faced tasks	List of tasks that the trainee has started,
Achieved tasks	List of tasks that the trainee has achieved
Best task	Ordered list of tasks which this trainee obtains the best results
Worst task	Ordered list of tasks which this trainee obtains the worst results

TABLE II.
SOCIAL MODEL

Attribute	description
Trainees	Number of trainees that must participate in this task
Type task	When this task is for a group, defines the way in which the trainees must address it
Difficulty task	Difficulty of task
Most connected trainee	Group member who receives the most messages (help, advices)
Most influential trainee	Group member who sends the most messages
Communication network	Number of contacts made by group
Levels	Describe task level and rules to calculate score
General score	Score for all group member

The proposed knowledge and competence model (table 1) is composed of three categories: personal, goal and task. Personal attributes contains general information about the trainee and his/her score (competences), the next categories are related to trainee achievements and contains information about goals and tasks that a trainee must address, has started or has achieved. The attributes related to these categories are initially empty, and they are updated when the trainee is playing. The list of goals must be specified before starting game because they must have a common goal for all group members. When a faced goals accomplished (proportion of tasks completed), then the achieved goals list is updated because all tasks associated with this goal have been completed. The attributes related to tasks work similarly to those just explained. Attributes (Best task and worst task) are intended to adapt the game to avoid the difficulties. In this way, the system has more information to propose the trainee who can help others.

B. Social Model

The goal of the social model is to deduce preferences and level of each player from social interaction, it allow changing player's level. The Social model must be able to gather social skills and generate feedback related to the interaction between players.

The social model is also composed of three categories: tasks (game play), interaction and evaluation. The first contains the number of trainees needed to solve the proposed task, and if more than one, it describes how trainees must address the task (type task). The attribute difficulty task is related to general difficulty of this task. The second category contains information about the general features of the group, three attributes are included: Most connected trainee, most influential trainee, and interaction network. The last category defines task levels and describes the rules (formulae) to calculate the general score.

V. CONCLUSION AND FUTURE WORKS

User's profiling is an important research area in adaptive multiplayer serious games, however only a limited number of games have been designed according to the user's profile.

This paper has proposed a conceptual user's profile to analyze collaborative learning in serious games. Two levels have been presented. The first is indented to describe knowledge and competence of each trainee, common goals, and an individual evaluation. The second has been defined with three specifications: tasks included in the game play, interaction between trainees and the group evaluation. The user's profile proposed is especially important the adaption because it contains information about what trainees have learned, how they have collaborated and the difficulties encountered. We are in the process to define a platform to integrate this model with a set of others models to aggregate all users input and history into some potential information to carry out an adaptive multiplayer serious game. In this manner, it is possible to adjust the difficulty to each trainee.

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